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## EDITORIAL

## Sustainable farming: chasing a mirage?

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### Introduction

‘When I use a word,’ Humpty Dumpty said in rather a scornful tone, ‘it means just what I choose it to mean — neither more nor less.’ – Lewis Carroll, *Through the Looking Glass*.

Scientists strive toward common and precise definitions as one of the main building blocks of progress. It came as quite a shock to me, once I entered the muddy waters of policy and public concerns, to realize that many people rely on the different interpretation of words in order to promote a spurious commonality of purpose. Sustainability is such a word. In the same meeting, I have heard sustainable farming used as a synonym for organic farming and someone else arguing that sustainable farming could only be achieved by increasing the level of public subsidy! Despite this linguistic plasticity, I do believe there is merit in considering the term in more detail, but with certain caveats. Firstly it must be accepted that the term is relative not absolute and is also influenced by time and place. For example, the importance of managing water use in promoting sustainable farming<sup>1</sup> is very different in Australia than it is in Wales, and depends upon the scale of farming relative to the natural hydrology of the region. Secondly, there is a need to consider the different aspects of sustainability both separately and in partnership, because that allows us to consider payoffs between objectives and how these might be managed.

Underlying these caveats is, however, a more general view, held by many of those involved in the science and practice of managing land that we should seek wherever possible to minimize the adverse impacts of agriculture whilst supporting its productivity. Given that each incoming quantum of solar radiation can only be absorbed once, even this aspiration can be seen to involve payoffs between production and the persistence of the “non-farmed” elements of agroecosystems. Faced with

unequivocal evidence of the damage done to both natural and agro-ecosystems by the spread of intensive agriculture (Firbank et al. 2008) and the growing demand for food, fuel, and fiber occasioned by global population growth (Beddington 2011), there have been a number of position papers produced on the best way to address this challenge. Options range between the optimistic technofix (Royal Society 2009) and the frankly Luddite (IAASTD 2008), with a tendency to suggest that there are straightforward linear solutions, even if no-one can quite agree what they are!

In what may turn out to be an act of extreme intellectual folly, I would like to adopt a rather different approach. Restricting my comments to the UK, I will examine the different elements of sustainability with the goal of identifying where the bottlenecks are and what might be necessary to overcome them. Although this leads me to make critical comments about farmers, scientists, politicians, and conservationists, it does allow me to emphasize the interconnections between farming, conservation, and rural politics and deal with the challenges of defining a policy framework where nonideal solutions are the norm, and in consequence, no one is ever completely satisfied. For convenience, and also because there is a body of work that uses the same divisions, I will consider sustainability as three subsets, economic, environmental, and social. I will consider economic sustainability first, since it is a necessary precondition for delivery of the other two. Then I will consider environmental sustainability, because recognition of its significance is growing much faster than the development of policy levers that allow it to be optimized, as evinced by the continuing decline in a range of indicators of environmental health. Finally, I will consider social sustainability, where the preservation of viable rural communities centered around but not necessarily supporting agriculture has lagged behind the other sustainability goals.

## Economic Sustainability

Farming is a business. Business viability depends on the ability to generate a margin on the sale of products that covers the fixed and variable costs of the enterprise and provides a livelihood for those involved. Pavord (2016) quotes figures from a 1696 analysis of English farming that suggest average incomes in today's terms of £123,000 against average land costs of £770 per acre for arable land and £1200 per acre for pasture. In 2014, average incomes for all but poultry farms were well below this figure (DEFRA 2015) and average land prices exceeded £8000 per acre (Farmers Weekly 2015). This stark comparison emphasizes the challenges of modern farming, and suggests that the traditional UK model of "mart" selling farm produce to processors, wholesalers and retailers may not be sustainable even in the short-to medium-term. The development of international trade, and in particular the increasing importance of commodity products in global agriculture has not benefitted farmers as much as it has processors, retailers and consumers. Although global demand for food is expected to increase by up to 50% by the middle of the 21st century, to date this has not resulted in increased margins for primary producers. Indeed, UK margins have fallen significantly in a number of sectors over the past few years.

This has put real pressure on UK agriculture, exacerbated by the continued strength of land prices that are driven by an investment potential rather than by an earning potential. The result is that the number of practitioners has fallen and the pattern of land ownership has changed. As an observer rather than a practitioner, it seems unlikely to me that these challenges will ease in the near future, which raises the question of whether there are viable alternatives to current practice. The history of farming in the UK is one of change, driven by external circumstances. The development of rotational mixed farming, land enclosure, chemical fertilization, and the increased role of mechanization all changed the industry and these changes were of necessity disruptive. I doubt that the next 50 years will be any less disruptive while farming comes to terms with the challenges of maintaining viable enterprises in a global environment where competitors benefit from cheaper land prices, lower labor costs and access to new technologies unavailable to European farmers.

To address this, I suggest that business planning should start from the need to make an adequate return from the asset base rather than from the need to protect existing farming systems. Adding value by processing on or near the farm, development of marketing cooperatives, pluriactivity, and the exploitation of new products and markets all have a role, and often these are not mutually

exclusive. A farm that generates income from sheep, beef, caravans, charcoal, and fishing rights is likely to be more resilient than its neighbors as well as more diverse. I remain unconvinced that blanket subsidies do more than stifle innovation, underwrite the costs of production, and reduce the price paid for commodity produce, and I argue in the section below that there are much more attractive targets for public support. Redirection of this support would also give farmers the freedom to be innovative at the enterprise level rather than at the system level.

Promoting genuine economic sustainability would not only energize the sector but would also provide a resilient backdrop to help address environmental and social sustainability. Significant political changes would be required, together with changes in attitude among many farmers and land managers. Listening to individual stories of innovation within the sector, I am frequently struck by not only how talented these practitioners are but also by how much hard work will be involved to make this approach the rule rather than the exception. Unfortunately, failure to improve economic sustainability will jeopardize progress elsewhere, and I see little current evidence of political will to undertake changes of this magnitude.

## Environmental Sustainability

The UK is unusual in that there is evidence that the development of agriculture actually increased overall biodiversity (Edwards and Hilbeck 2001). By clearing and managing woodland, creating substantial areas of disturbed ground, and a landscape mosaic including interconnecting linear features, such as hedgerows and paths, the habitats for ruderal herbaceous species and their congruent animals, birds, and insects were significantly increased. This, together with the generally abundant rainfall, mild climate, and young postglacial soils led to the appearance of stable, relatively productive agroecosystems that were also reservoirs of both biodiversity and landscape diversity. The concept of "natural capital" (World Forum on Natural Capital 2015) has been devised to cover these stocks of natural assets which include geology, soil, air, water, and all living things. It is from this that humans derive the range of services that make human life possible. Until the 19th century, it appears that the emerging patterns of UK land use increased natural capital rather than exploiting it. This has two interesting consequences. Firstly it means that any discussion of environmental sustainability must be based around agroecosystems rather than natural ecosystems, since the vast majority of UK land is or has been managed in some way. Secondly it highlights the dilemma already mentioned in the introduction, that there will be competition for resources within agroecosystems between the "farmed" and "non-farmed" components.

While some resources can be augmented by management practice, incoming solar radiation frequently determines the “productivity ceiling” for both components. Following from this is the inescapable conclusion that there are payoffs between them, with increases in agricultural productivity eventually impinging on preservation of natural capital.

The intensification of UK farming over the last century has provided plenty of examples of habitat loss and habitat degradation, leading to marked declines in abundance of keynote species and genera. Interestingly, simple agronomic changes such as the shift from hay to silage as a way of conserving ruminant feed can have effects that are just as dramatic as those attributed to overuse of pesticides and other agrochemicals (Vickery et al. 2001). Generally hay is harvested after the wild flowers in the meadow have set seed, whereas silage is harvested much earlier. The depletion of the seed bank removes a vital food source for insects and farmland birds and removes herbs from the pasture. However, good-quality silage is a much better ruminant feed than hay and yields are higher since more than one harvest can be taken, so there are sound agronomic reasons for shifting to silage. Payoffs of this kind are common across a range of different agroecosystems and it is my assertion that we need to think and work in a very different way if we are to restore some sense of balance to the environmental management of land and protect or to increase natural capital rather than deplete it.

Given that changes in practice will have to occur against the financial background outlined above, I would argue that all those involved will have to develop new ways of working. Agricultural scientists need to take systems approaches throughout their research and make much more use of mathematical modeling so that payoffs can be identified early and managed effectively. The agroecosystem approach has to extend to the activities of conservation bodies, who are often driven by concerns for individual subsets of the flora, fauna, and landscape. These bodies also have to accept that farmers are part of the solution, since they own the land and deliver stewardship. However, it is farmers and policy makers who have the biggest responsibility and who will need to change attitudes most markedly. Given that the effective delivery of ecosystem services is necessary for human life and wellbeing, it seems to me that we can no longer rely upon the good nature of farmers to provide them for free. I view ecosystem services as “co-products” of farming just as much as firewood is a coproduct of woodland management or garden soil is a coproduct of beet refining. What is absent in the case of ecosystem services is a mechanism by which farmers can gain direct economic benefit from delivering these coproducts in a way that

reflects their importance. Blanket subsidies, particularly if linked to income foregone, will not allow farmers to take the sort of investment decisions that can compare the value of a wheat crop with that of the wild birds and mammals using the crop as a habitat.

I do not minimize the difficulties of coming up with a valuation framework to achieve this, or of then persuading policy makers to implement support mechanisms to promote it, but I do not believe the *status quo* is an option, given the intensity of the financial pressures currently facing farmers. Interestingly, organizations such as the Countryside Restoration Trust (2016) use donations from members as a proxy for environmental support, while retaining the ability to sell agricultural output. Others, such as LEAF farms (2016) also encourage the generation of added value products as well as delivering farming systems that sustain production but have less impact. These, and other similar approaches, provide useful lessons but are not necessarily applicable on a large scale. The discussions initiated as part of the Natural Capital Initiative (2016) address these issues and provide a significant intellectual resource, but have not yet obtained the traction with the industry and with policy makers that is required if we are to “break the mould” and look at sustainable land use in a more holistic way.

## Social Sustainability

Historically, rural communities supported agriculture in terms of labor and underpinning services. The archetypal UK market town served as a focus for trade, religion, legal matters, recreation and, in many cases, defense. It also reflected the range of agricultural enterprises that supported it. The development of mechanized, global agriculture, and the sharp decline in the number of people employed directly in agriculture has led to major changes in this relationship. In countries like the USA where population density is low, depopulated farming townships have simply been abandoned. In the crowded UK, their function and demography has changed, with far fewer people engaged in or supporting agriculture. Tourism, second home ownership, and commuting have maintained (or even extended) property ownership in rural communities, but the separation from their original *raison d'être* has changed their nature. Loss of key facilities like primary schools, pubs, post offices, and village stores coupled with the arrival of residents who have no links to the agrarian past often leads to disagreement about the nature of the community.

In my view, some of this change is inevitable, and echoes changes that have been going on in rural communities for centuries as the nature of the surrounding agriculture has changed. During the 20th century, the smithy, for example, shifted from work with horses and

horse-drawn implements to the repair and modification of mechanical equipment, often augmented by craft work for tourists who valued hand-made artifacts. However, it has to be accepted that what has happened since 1945 has proceeded faster and been more far-reaching than previous changes.

The approaches outlined in the two sections above would, if implemented, go some way to rebalance rural communities. Enhancement of product value, equitable payment for “co-products” and pluriactivity would keep wealth closer to the farm and facilitate spending in the local environment. This, in turn, would encourage the development of small enterprises based upon support for the delivery of environmental services as well as support for production. There are already examples of this in Wales where the Tir Cymen scheme helped develop businesses associated with, for example, replanting native provenance hedging or replacing wooden gates and foot-bridges (Banks and Marsden 2000). However, this will be necessary but not sufficient to recreate sustainable rural communities. Once again active policy involvement will be required to attract enterprises that will benefit from the rural environment, bring employment to local communities but which have no direct link to agriculture. Closer links between planning, infrastructure and provision of local services need to be linked to economic and social science appraisals of the likely impacts of research on rural communities. For example, the use of superfluous farm buildings as accommodation for novel business start-ups can only be promoted if there is a workforce nearby with access to housing, if suitable training is available, if broadband access is already in place, and if the community can support the families of the workforce. Failure to access any one of these will compromise success. Many of these issues have been identified and considered in the Rural Economy and Land Use research programme (Relu Briefing Paper 2010) but again there has been relatively little progress beyond the academic evaluation of options into direct impacts on policy development, delivery and monitoring.

## Concluding Remarks

The key property of mirages is that they recede as fast as you approach them and are, therefore, unattainable. I have argued that we do understand enough about the basis of sustainable agriculture in the UK to have an idea of where we should be going, so to that extent we are not chasing a mirage. However, the practicalities of getting there are a very different matter. We need to develop a practitioner community that has a much broader approach to income generation, a research base that considers systems holistically, and a policy framework that treats environmental

goods as coproducts that can be valued and incorporated into viable businesses. We need a more nuanced approach from the charity sector to ensure that farmers and conservationists work together and we need to help this sector to generate added value that can be used locally to support rural communities rather than to benefit distant companies and shareholders. By chance, I have written this paper at a time of massive political change within the UK. Although this change is likely to be both uncomfortable and unpredictable, it does offer an opportunity to break free from the complex, doctrinaire and dirigiste support system of the CAP and move toward something that will promote a more sustainable approach to UK farming. Groups like the Natural Capital Initiative should, in my view, go on the offensive to make the case for radical reform of support for farming and the practitioner groups have to demonstrate that they accept the need for such radicalism. If this happens, then we can make real progress toward a more sustainable agriculture that preserves all that is best about the UK landscape. If it does not, then I fear that we are doomed to a continuing decline in both the farming industry and in the quality of our managed environment.

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## Conflicts of Interest

None declared.

## Note

<sup>1</sup>In this paper, farming and agriculture are used as blanket terms to cover all forms of seasonal exploitation of land and fresh water for profit.

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